015 Analogue Input for Lego RCX Module

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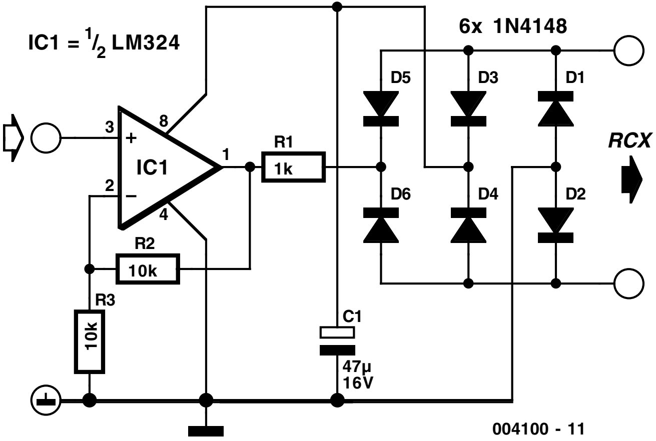
Up to now, there has not been an analogue input for the RCX block. The circuit presented here allows the RCX block to detect analogue voltages. The approach used here even allows this function to be used with existing Lego software, although this naturally amounts to a certain 'misuse' of the interface.

If an RCX input is set to the 'light sensor' mode, the internal logic senses the resistance between the two terminals of the selected input. The circuit presented here converts an analogue input voltage in the range of 0 to 2.5 V into something like a resistance. It's easy to explain how this is done. The analogue input voltage, amplified by a factor of two, appears at the out-



put of the opamp. Resistor R1 is located between the output of the RCX block and the buffered input voltage. If the input voltage is low, there is a relatively large voltage across R1. The RCX block measures a relatively high output current and thus thinks that the sensor has a low resistance. If the buffered input voltage is nearly 2.5 V, there is almost no voltage across R1. Little current flows, and the RCX block sees a high resistance.

Based on experiments, a value of 1 kΩ is a good choice for R1, but you may want to try other values. The value of R1 may be increased up to a maximum of 3.3 kΩ. Above this value, the characteristic of the adapter deviates too much from that of the light sensor, so that it is not possible to use the full measurement range. With the suggested value for R1, the measurement value ranges from 95 (with an input of 0 V) to approximately 5 (with an input of 2.5 V). The curve between these two values is reasonably linear in the region between 0.5 V and 2.5 V.

The rest of the circuit is self-explanatory. Diodes D1 through D4 form a full-wave bridge rectifier, so that the polarity of the connecting wires for the RCX input does not matter. The rectified voltage is buffered by capacitor C1 and then used to power the opamp. Measurement resistor R1 is also connected to the RCX input by two diodes, in order to avoid polarity problems with the connections.

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